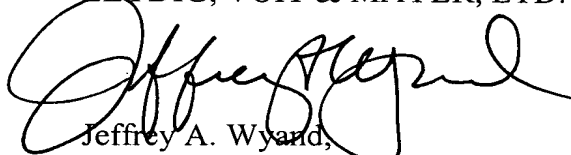


REMARKS

The foregoing amendments are made to correct minor translational errors and to meet United States requirements as to form. No new matter is added.

Respectfully submitted,

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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:

SHINYA SOEDA

| | | | |
|-----------------|--|-----------|------------|
| Application No. | Unassigned | Art Unit: | Unassigned |
| Filed: | February 20, 2002 | Examiner: | Unassigned |
| For: | SEMICONDUCTOR DEVICE AND METHOD OF FABRICATING THE SAME | | |

**AMENDMENTS TO SPECIFICATION, CLAIMS, AND
ABSTRACT MADE VIA PRELIMINARY AMENDMENT**

Amendments to the paragraph beginning at page 1, line 4:

The present invention relates to a multilayer-circuit-type semiconductor device having resistors and signal line region(s) and a method of fabricating the same. Particularly, this invention relates to the semiconductor device ~~capable of~~ preventing relative fluctuations in resistance among the resistors and, moreover, preventing fluctuations in interconnection capacitance (stray capacitance) because of the influence of the interconnection patterns in upper or lower layers of the signal-wiring, and to ~~the~~ a method of fabricating this semiconductor device.

Amendments to the paragraph beginning at page 1, line 17:

Conventionally, data ~~transaction is~~ transactions are performed between LSI's, such as memories, microcomputers, and ~~logics~~ logic elements to control ~~an~~ electrical equipment and to perform video and audio signal processing. However, eRAM (embedded RAM) obtained by integrating these LSI's into one chip, based on progress in both process and design technologies, has been intensively focused on as a new device

(i.e., system LSI). The eRAM obtained by integrating ASIC's, microcomputers, and large-capacity memories can realize the equipment that is more compact, has higher-speed data transfer due to expanded bus width, and has lower power consumption as compared to a combination of a general-purpose memory and a microcomputer.

Amendments to the paragraph beginning at page 2, line 4:

~~As the semiconductor device is micromachined more and more and~~ As devices are becoming still more highly integrated, the structure of the semiconductor device is becoming more and more complicated. ~~Number~~ The number of layers of a multilayer-circuit for a logic system have increased. Because of such complicated structure, the disadvantages described below have occurred. Specifically, depending on whether an interconnection pattern is present on upper or lower layers of a layer on which resistors ("resistor group") or signal line region(s) are provided, there may occur ~~the~~ problems, such as thermal influence over these group groups and region regions due to sintering during fabrication of the semiconductor, ~~influence~~ influences caused by fluctuations in stray capacitance due to a difference of ~~film thickness between~~ thicknesses of the layers, and electrical influence during operation of the semiconductor. Accordingly, it becomes more important whether the resistor group and the signal line region ~~provided~~ located in a logic region can be operated stably.

Amendments to the paragraph beginning at page 2, line 21:

Fig. 6A is a plan view of DRAM consolidated logic that has been conventionally used. This DRAM consolidated logic has a DRAM region E1 and a logic region E2. Fig. 13 and Fig. 14 show cross-sectional views taking along ~~lines A-A'~~ line XIII-XIII of Fig. 6A showing a structure covering a first Al interconnection layer of the DRAM consolidated logic in Fig. 6A. In this type of DRAM-logic hybrid device, a cylindrical stacked capacitor (concave) having a certain height is formed in the DRAM region E1. The stacked capacitor is composed of a lower capacitor electrode layer 122, dielectric film 123, and an upper capacitor electrode layer 124.

Amendments to the paragraph beginning at page 3, line 7:

Fig. 13 shows an example of the DRAM consolidated logic including a region having the resistor group composed of a group of diffused resistors in the logic region E2. The resistor group arranged in the logic region E2 is ~~formed~~ provided to be used as additional resistors. In Fig. 13, the resistor group is composed of the belt-like isolation oxide films 105 spaced apart from and extending in parallel with each other on the main surface of the semiconductor substrate, and N⁺ diffused regions 104 each extending between the belt-like isolation oxide films 105. The first Al interconnection layer 129 is ~~formed~~ located on the upper layer of the resistor group in the logic region E2.

Amendments to the paragraph beginning at page 3, line 19:

Fig. 14 shows an example of the DRAM consolidated logic including a region having the signal interconnection in the logic region E2. In Fig. 14, two different layers of signal ~~interconnection~~ interconnections are ~~formed~~ located in the logic region E2, that is, a signal interconnection 126a formed by utilizing a layer common to a bit line 126 in the DRAM region E1, and a signal interconnection 108a formed by utilizing a layer common to a gate electrode in the DRAM region E1. The first Al interconnection layer 129 is ~~formed~~ located above the region having the signal interconnections 108a and 126a.

Amendments to the paragraph beginning at page 4, line 4:

In the conventional art, however, in association with an increase in the number of interconnection layers in the logic region E2, the resistor group and the signal interconnection ~~formed~~ in the logic region E2 are affected by how a pattern is arranged on the upper layer or the lower layer. Therefore, the problems as follows occur.

Amendments to the paragraph beginning at page 4, line 10:

Firstly, there is a problem that relative resistance within the resistor group fluctuates depending on whether a pattern is present on the first Al interconnection layer 129 as the upper layer. For example, when any faults on a substrate produced due to etching or the like during fabrication are to be ~~recovered~~ removed by sintering executed after formation of the first Al interconnection, ~~recovery~~ removal of the faults on the substrate may become non-uniform due to presence or absence of a pattern on the first Al interconnection layer 129 as the upper layer. Traps caused by a boundary potential on the surface of the resistors may become non-uniform within the resistor group. Therefore, fluctuations in the relative resistance within the resistor group in an analog line or the like become a problem (see Fig. 13)

Amendments to the paragraph beginning at page 4, line 25:

Secondly, by patterning the signal interconnections 108a and 126a under the first Al interconnection layer 129, a difference in an interlayer ~~film~~ thickness under the first Al interconnection layer 129 occurs between a portion having a signal pattern and a portion not having a signal pattern, stray capacitance to the base fluctuates, and a difference occurs between actual resistance and the simulated ~~one~~ resistance during circuit design (see Fig. 14). The fluctuation in stray capacitance becomes a serious problem in the pattern in which a change of the signal interconnection or the like is not desirable. Further, during operation of the semiconductor device, the signal interconnection is electrically affected by the pattern of other signal interconnection ~~formed~~ on the upper layer or the lower layer. Therefore, stable signal circuit cannot be obtained.

Amendments to the existing claims:

1. (Amended) A semiconductor device comprising:
a semiconductor substrate having a plurality of regions;
a resistor group including a plurality of resistors ~~provided~~ located in one of said regions of said semiconductor substrate;

a metal interconnection layer ~~above~~ opposite the region in which said resistor group ~~has been provided~~ is located; and
a shielding layer between said resistor group and said metal interconnection layer.

2. (Amended) The semiconductor device according to claim 1, comprising at least ~~a one~~ one DRAM region and ~~a one~~ one logic region, ~~wherein including~~ including a layer common to a bit line layer in said DRAM region ~~is and~~ is and used as ~~a said~~ a said shielding layer in said logic region.

3. (Amended) The semiconductor device according to claim 1, comprising at least ~~a one~~ one DRAM region with a stacked capacitor and ~~a one~~ one logic region, wherein said stacked capacitor in said DRAM region ~~is composed of~~ includes a lower capacitor electrode layer, a dielectric film, and an upper capacitor electrode layer, and a layer common to said upper capacitor electrode layer in said DRAM region ~~is and~~ is and used as ~~a said~~ a said shielding layer in said logic region.

4. (Amended) The semiconductor device according to claim 1, wherein ~~a potential of~~ a potential of said shielding layer ~~is~~ has a fixed potential.

5. (Amended) A semiconductor device comprising:
a semiconductor substrate;
a signal interconnection layer on said semiconductor substrate; and
a shielding layer on at least one side of said signal interconnection layer, ~~or shielding layers on both sides of said signal interconnection layer~~.

6. (Amended) The semiconductor device according to claim 5, comprising at least ~~a one~~ one DRAM region and ~~a one~~ one logic region, ~~wherein including~~ including a layer common to a gate electrode layer in said DRAM region ~~is and~~ is and used as ~~a said~~ a said shielding layer in said logic region.

7. (Amended) The semiconductor device according to claim 5, comprising at least ~~a one~~ one DRAM region and ~~a one~~ one logic region, ~~wherein including~~ including a layer common to a bit line layer in said DRAM region ~~is and~~ is used as ~~a said~~ a shielding layer in said logic region.

8. (Amended) The semiconductor device according to claim 5, comprising at least ~~a one~~ one DRAM region with a stacked capacitor and ~~a one~~ one logic region, wherein said stacked capacitor in said DRAM region ~~is composed of~~ includes a lower capacitor electrode layer, a dielectric film, and an upper capacitor electrode layer, and a layer common to said upper capacitor electrode layer in said DRAM region ~~is and~~ is used as ~~a said~~ a shielding layer in said logic region.

9. (Amended) The semiconductor device according to claim 5, wherein ~~a potential of~~ has a fixed potential of said shielding layer ~~is~~ has.

10. (Amended) A method of fabricating a semiconductor device having at least ~~a one~~ one DRAM region and ~~a one~~ one logic region and having a resistor group in said logic region, the method comprising:

forming a resistor group in said logic region;
forming a shielding layer in said DRAM region and said logic region; and
forming a metal interconnection layer ~~above~~ opposite a portion of said logic region ~~in which where~~ where said resistor group ~~has been formed~~ is located.

12. (Amended) The method according to claim 10, further comprising forming a stacked capacitor ~~composed of~~ having a lower capacitor electrode layer, a dielectric film, and an upper capacitor electrode layer in said DRAM region, wherein said capacitor electrode layer ~~is used as~~ is said shielding layer.

13. (Amended) The method according to claim 10, further comprising fixing ~~a~~ potential of said shielding layer.

14. (Amended) A method of fabricating a semiconductor device having at least ~~a~~

one DRAM region and ~~a~~ one logic region and having a signal interconnection layer in said logic region, the method comprising:

forming a signal interconnection layer in said logic region; and
forming a shielding layer on at least one side of said signal interconnection layer;
~~or forming shielding layers on both sides of said signal interconnection layer,~~ in said DRAM region and said logic region.

17. (Amended) The method according to claim 14, further comprising forming a stacked capacitor ~~composed of~~ having a lower capacitor electrode layer, a dielectric film, and an upper capacitor electrode layer in said DRAM region, wherein said capacitor electrode layer is ~~used as~~ said shielding layer.

18. (Amended) The method according to claim 14, further comprising fixing ~~a~~ potential of said shielding layer.

Amendments to the abstract:

ABSTRACT OF THE DISCLOSURE

A semiconductor device has a semiconductor substrate and a resistor group and/or a signal interconnection layer ~~on~~ in a region ~~in the~~ of the semiconductor substrate. A shielding layer ~~provided~~ is located above and/or below the region where the resistor group and/or the signal interconnection layer ~~has been provided~~ are located.